4. $m = \iint_S kz \, dS$ $\quad S: z = \sqrt{9-x^2-y^2}$

$g(x,y) = (9-x^2-y^2)^{\frac{1}{2}}$

$m = \iint K\sqrt{9-x^2-y^2}\sqrt{1+\left(\frac{-x}{\sqrt{9-x^2-y^2}}\right)^2+\left(\frac{-y}{\sqrt{9-x^2-y^2}}\right)^2}$

$g_x = \frac{1}{2}(9-x^2-y^2)^{-\frac{1}{2}} \cdot (-2x) = \frac{-x}{\sqrt{9-x^2-y^2}}$

$m = \iint K\sqrt{9-x^2-y^2}\sqrt{1+\frac{x^2}{9-x^2-y^2}+\frac{y^2}{9-x^2-y^2}}$

$g_y = \frac{-y}{\sqrt{9-x^2-y^2}}$

$m = \iint K\sqrt{9-x^2-y^2}\sqrt{\frac{9-x^2-y^2}{9-x^2-y^2}+\frac{x^2}{9-x^2-y^2}+\frac{y^2}{9-x^2-y^2}}$

$m = \iint K\sqrt{9-x^2-y^2}\sqrt{\frac{9}{9-x^2-y^2}}$

$m = \iint K\sqrt{9-x^2-y^2}\cdot\frac{\sqrt{9}}{\sqrt{9-x^2-y^2}}$

$z = \sqrt{9-x^2-y^2}$

$0 = \sqrt{9-x^2-y^2}$

$0 = 9-x^2-y^2$

$x^2+y^2 = 9$

$m = \iint 3K$

$m = \int_{\theta=0}^{\theta=2\pi}\int_{r=0}^{r=3}(3K)\,r\,dr\,d\theta$

$m = 3K\int_{\theta=0}^{\theta=2\pi}\left[\frac{1}{2}r^2\right]_{r=0}^{r=3}d\theta$

$m = 3K\cdot\frac{9}{2}\int_{\theta=0}^{\theta=2\pi}d\theta$

$m = \frac{27}{2}K\left[\theta\right]_0^{2\pi}$

$m = \frac{27}{2}K\cdot 2\pi$

$m = 54\pi K$